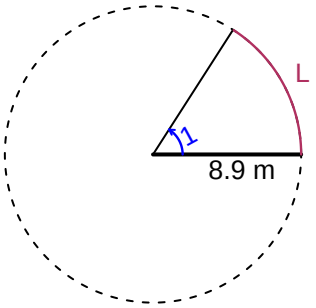
Name: Date:

Trig Final (SLTN v627)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1 radians. The radius is 8.9 meters. How long is the arc in meters?

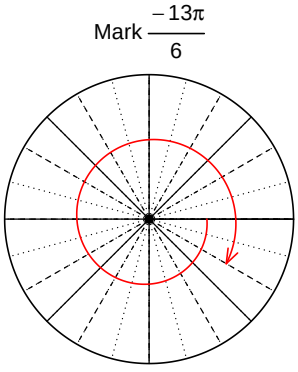


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

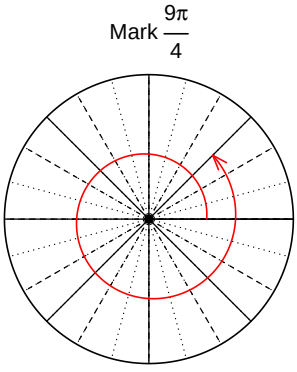
$L = 8.9$ meters.

Question 2

Consider angles $\frac{-13\pi}{6}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-13\pi}{6}\right)$ and $\cos\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-13\pi/6)$



Find $\cos(9\pi/4)$

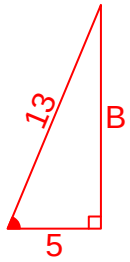
$\sin(-13\pi/6) = \frac{-1}{2}$

$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-5}{13}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

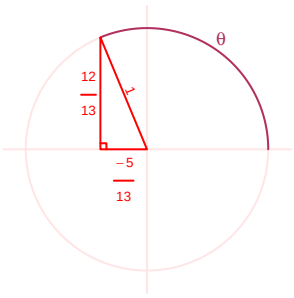
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$5^2 + B^2 = 13^2$$
$$B = \sqrt{13^2 - 5^2}$$
$$B = 12$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{12}{13}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 7.6 Hz, a midline at $y = -8.96$ meters, and an amplitude of 3.43 meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.43\cos(2\pi 7.6t) - 8.96$$

or

$$y = -3.43\cos(15.2\pi t) - 8.96$$

or

$$y = -3.43\cos(47.75t) - 8.96$$